

Guidance for Industry and FDA Staff

Guidance Document for Vascular Prostheses 510(k) Submissions

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**U.S. Department Of Health And Human Services
Food and Drug Administration
Center for Devices and Radiological Health**

**Circulatory Support and Prosthetic Devices Branch
Division of Cardiovascular, Respiratory and Neurological Devices
Office of Device Evaluation**

Preface

Public Comment

Comments and suggestions may be submitted at any time for Agency consideration to, Dorothy B. Abel, Center for Devices and Radiological Health, HFZ-450, 9200 Corporate Boulevard, Rockville, MD 20850. Comments may not be acted upon by the Agency until the document is next revised or updated. For questions regarding the use or interpretation of this guidance contact Dorothy B. Abel at (301) 443-8262, extension 165 or by electronic mail at dba@cdrh.fda.gov.

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Guidance¹ Document for Vascular Prostheses 510(k) Submissions

Introduction

This guidance document describes a means by which vascular graft prostheses devices may comply with the requirement of special controls for class II devices. Designation of this guidance document as a special control means that manufacturers attempting to establish that their device is substantially equivalent to a predicate vascular graft prostheses device should demonstrate that the proposed device complies with either the specific recommendations of this guidance or some alternate control that provides equivalent assurances of safety and effectiveness.

This guidance was developed as a special control to support the reclassification from class III to class II for vascular graft prostheses of less than 6 millimeters in diameter. (21 C.F.R. § 870.3450). It also applies to vascular graft prostheses of 6 millimeter and greater diameter. (21 C.F.R. § 870.3460.) It includes vascular grafts that are intended for vascular access. It excludes vascular grafts intended for coronary and neurovasculature. It includes a tabular summary of the risks associated with the use of the device and the corresponding special controls to address these risks.

All manufacturers must comply with the Quality Systems Regulations; (QSR) set forth in the Code of Federal Regulations at 21 C.F.R. Part 820. QSR issues of particular significance

¹ ¹This document is intended to provide guidance. It represents the Agency's current thinking on the above. It does not create or confer any rights for or on any person and does not operate to bind FDA or the public. An alternative approach may be used if such approach satisfies the requirements of the applicable statute, regulations, or both.

to manufacturers of permanently implantable medical devices, such as vascular grafts, include but are not limited to the following:

Overall Controls

- Management responsibility
- Design controls
- Document controls
- Purchasing controls
- Identification
- Traceability of finished and in-process devices
- Production and process controls
- Inspection, measuring and test equipment

Process Validation

- Acceptance activities
- Raw materials
- In-process and finished device acceptance
- Non-conforming product
- Corrective and preventative action
- Labeling and packaging control
- Handling and storage
- Distribution and records

It is further recommended that vascular graft manufacturers utilize relevant provisions of ANSI/AAMI VP20-1994, Cardiovascular Implants-Vascular Prostheses, where appropriate.

TABLE OF RISKS AND CORRESPONDING CONTROLS²

RISK	CONTROLS
1. Thrombosis Embolic Events Occlusion Stenosis	510(k)
	Characterize the graft material in accordance with ANSI/AAMI VP20-1994, <i>Cardiovascular implants - Vascular prostheses</i> (ANSI/AAMI VP20-1994), Section 4.3 (Materials and Construction).
	Address the issue of biological safety in accordance with FDA guidance document Use of International Standard ISO 10993, “Biological Evaluation of Medical Devices Part 1: Evaluation and Testing” (FDA biocompatibility guidance) and ANSI/AAMI VP20-1994, Section 4.4 (Biocompatibility and Biostability).
	Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.
	Provide a characterization of kink radius in accordance with ANSI/AAMI VP20-1994, Section 5.9 (Kink Diameter/Radius).
	Address the adequacy of attachment of the support such that normal handling and implantation forces should not disrupt the external support, for those devices that incorporate permanent or removable external support.
	Address removal of the external support such that removal should not impair device integrity, for those devices that incorporate removable external support.
	Labeling - Instructions for Use
	Provide labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).
	Indicate that thrombosis, embolic events, occlusion, and stenosis are potential complications associated with the use of vascular grafts.

² Because the risks associated with large and small diameter vascular grafts and vascular access grafts are generally the same, most of these special and general controls apply equally to all vascular grafts. Some special controls, such as strength testing after repeated puncture, apply solely to grafts intended for vascular access.

RISK	CONTROLS
1. Thrombosis Embolic Events Occlusion Stenosis continued	<p style="text-align: center;">Labeling - Instructions for Use</p> <p>Recommend techniques for implanting the vascular graft, e.g., tunneling (with consideration for external support, if appropriate), and methods to avoid kinking, where appropriate.</p>
	<p>Provide instructions, where appropriate, on how to safely perform a revision procedure in the case of occlusion.</p>
	<p>State that the physician should consider the need for intraoperative and postoperative patient anticoagulation therapy.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>
	<p style="text-align: center;">510(k)</p> <p>Conduct all appropriate tests specified in ANSI/AAMI VP20-1994, Section 5.2 (Porosity, Water Permeability, Integral Water Permeability/Leakage, and/or Water Entry Pressure).</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
2. Leakage (a) Hematoma (b) Hemorrhage (c) Blood Leakage (from failure to clot)	<p style="text-align: center;">Labeling - Instructions for Use</p> <p>Provide labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>
	<p>Provide instructions for proper pre-clotting of the graft (if applicable) and use of hemostatic agents (if applicable).</p>
	<p>State that potential complications associated with vascular grafts include leakage (which may occur in conjunction with hematoma, hemorrhage, and blood leakage from failure to clot).</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>

RISK	CONTROLS
3. Biocompatibility Allergic Reaction	<p style="text-align: center;">510(k)</p> <p>Address the issue of biological safety in accordance with FDA biocompatibility guidance and ANSI/AAMI VP20-1994, Section 4.4 (Biocompatibility and Biostability).</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
	<p style="text-align: center;">Labeling - Instructions for Use</p> <p>Contraindicate device use for patients with known sensitivity to device material.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>
4. Graft Disruption: Axillary Anastomotic Suture Line dehiscence	<p style="text-align: center;">510(k)</p> <p>Conduct testing in accordance with ANSI/AAMI VP20-1994, Sections 5.3 (Strength) and 5.8 (Suture Retention Strength).</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
	<p style="text-align: center;">Labeling - Instructions for Use</p> <p>Provide labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>
	<p>Discuss implantation techniques relating to product sizing; product placement; tunneling (with consideration for external support, if appropriate); and methods to avoid unduly stressing the axillary or femoral anastomoses.</p>
	<p>Indicate that the health care provider is responsible for instructing the patient as to proper postoperative care, including limiting movement of the affected area during the convalescent period.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>

RISK	CONTROLS
5. Seroma	<p align="center">510(k)</p> <p>Conduct all appropriate tests specified in ANSI/AAMI VP20-1994, <i>Cardiovascular implants - Vascular prostheses</i>, Section 5.2 (Porosity, Water Permeability, Integral Water Permeability/Leakage, and/or Water Entry Pressure).</p>
	<p align="center">Labeling - Instructions for Use</p> <p>Provide adequate labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>
	<p>State that seroma is a potential risk associated with the use of vascular grafts.</p>
	<p>Address techniques for graft handling and instrument manipulation (e.g., clamping).</p>
	<p>Provide instructions for proper implant techniques, such as tunneling (with consideration for external support, if appropriate).</p>
6. False Aneurysm/ Pseudoaneurysm	<p align="center">510(k)</p> <p>Conduct testing in accordance with ANSI/AAMI VP20-1994, Section 5.8 (Suture Retention Strength).</p>
	<p>Conduct testing in accordance with ANSI/AAMI VP20-1994, Section 8.3.4 (Method for Determination of Strength After Repeated Puncture), if the indications for use include vascular access.</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
	<p align="center">Labeling - Instructions for Use</p> <p>Provide labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>

RISK	CONTROLS
6. False Aneurysm/ Pseudoaneurysm continued	<p style="text-align: center;">Labeling - Instructions for Use</p> <p>Recommend product-specific techniques for implanting and revising the vascular graft, if appropriate, and should indicate that care should be taken when cannulating the graft for dialysis access (e.g., avoidance of external support during cannulation, proper rotation of cannulation sites, post cannulation care such as proper compression to achieve hemostasis, etc).</p>
	<p>Provide appropriate instructions for graft handling and sizing (with consideration for external support, if appropriate, and potential arterial steal syndrome, if appropriate).</p>
	<p>Indicate that the health care provider is responsible for instructing the patient as to proper postoperative care.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>
7. True Aneurysm/ Dilatation	<p style="text-align: center;">510(k)</p> <p>Conduct testing in accordance with ANSI/AAMI VP20-1994, Section 4.4.2 (Biostability), 5.8 (Suture Retention Strength), Section 5.6 (Pressurized internal diameter), and Section 5.3 (Strength).</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
	<p style="text-align: center;">Labeling - Instructions for Use</p> <p>Provide adequate labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>
	<p>Recommend product-specific techniques for implanting and revising the vascular graft, if appropriate, and should indicate that care should be taken when cannulating the graft for dialysis access (e.g., avoidance of external support during cannulation, proper rotation of cannulation sites, post cannulation care such as proper compression to achieve hemostasis, etc.).</p>

RISK	CONTROLS
7. True Aneurysm/ Dilatation continued	<p align="center">Labeling - Instructions for Use</p> <p>Provide instructions for graft handling and sizing.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>
8. Infection/Sterility	<p align="center">510(k)</p> <p>Perform a sterilization validation to ensure that the sterilization process is capable of providing the Sterility Assurance Limit (SAL) of 10^{-6}, in accordance with suitable guidance (e.g., ANSI/AAMI VP20-1994, Section 4.5 (Sterility), ANSI/AAMI/ISO 11134-1993, ANSI, AAMI/ISO 11135-1994, and ANSI/AAMI/ISO 11137-1994). Alternate sterilization methods should be validated to an appropriate SAL. If resterilization is indicated, manufacturers should also perform a validation of the resterilization method in accordance with suitable guidance.</p>
	<p>Describe the sterilization method that will be used; the method that used to validate the sterilization cycle, and the SAL. Describe how the packaging serves to maintain the device sterility. For ETO sterilization, state the maximum levels of residues of ethylene oxide, ethylene chlorohydrin, and ethylene glycol. State whether the product is non-pyrogenic, and describe the method used to make that determination. For radiation sterilization; state the radiation dose used. See also, <u>Sterility Review Guidance, and Revision of 11/18/90 #K90-1</u>.</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
	<p>Provide a statement that biological testing (including pyrogen and bioburden testing) will be or has been performed to assess acceptable limits of biological contaminants.</p>
	<p>Provide a statement that package shelf life validation (including package integrity/distribution testing, accelerated aging, microbial challenge testing, and real time follow-up) will be or has been performed, in accordance with ANSI/AAMI VP20-1994, Section 4.5.1 (Shelf life), to determine that the device and package will maintain their integrity for the period of time specified on the device label, or should provide a justification as to why such validation is not necessary.</p>

RISK	CONTROLS
8. Infection/Sterility continued	<p align="center">Labeling - Instructions for Use</p> <p>Provide labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>
	<p>State that the product is supplied sterile on the product package label and in the Instructions for Use.</p>
	<p>Provide instructions for opening the vascular grafts package.</p>
	<p align="center">Labeling - Instructions for Use</p> <p>Instruct the user that sterility cannot be assured if the graft packaging has been opened or damaged.</p>
	<p>State that the health care provider is responsible for instructing the patient as to proper postoperative care.</p>
	<p>State that the health care provider must observe aseptic technique during implantation and postoperatively.</p>
	<p>Address resterilization, where resterilization is an indication.</p>
	<p>State that infection is a potential complication associated with the use of vascular grafts.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>
9. Performance	<p align="center">510(k)</p> <p>Conduct testing on finished devices in accordance with ANSI/AAMI VP20-1994, Sections 4.4.2 (Biostability), 5.2 (Porosity, Water Permeability, Integral Water Permeability/Leakage, and Water Entry Pressure), 5.3 (Strength), 5.4 (Length), 5.5 (Relaxed Internal Diameter), 5.6 (Pressurized Internal Diameter), 5.7 (Wall Thickness), 5.8 (Suture Retention Strength), and 5.9 (Kink Diameter/Radius). Manufacturers should also address applicable requirements specified in ANSI/AAMI VP20-1994, Section 5 (Introduction).</p>
	<p>Assure that subjecting prostheses to the maximum number of sterilization cycles recommended, (where resterilization is indicated) does not adversely affect the properties of the device, in accordance with ANSI/AAMI VP20-1994, Section 4.5 (Sterility).</p>

RISK	CONTROLS
9. Performance (continued)	<p align="center">510(k)</p> <p>Address the adequacy of attachment of the support such that normal handling and implantation forces should not disrupt the external support, for those devices that incorporate permanent or removable external support.</p>
	<p>Address removal of the external support such that removal should not impair device integrity, for those devices that incorporate removable external support.</p>
	<p>Address shelf life testing, for new or substantially modified materials, in accordance with ANSI/AAMI VP20-1994, Section 4.5.1 (Shelf Life).</p>
	<p>Conduct testing in accordance with ANSI/AAMI VP20-1994, Section 5.3, paragraphs 3 and 4 (Strength after Repeated Puncture), if the indications for use include vascular access.</p>
	<p>Conduct preclinical and/or clinical (<u>in vivo</u>) evaluations of devices incorporating new or substantially modified materials or design, in accordance with ANSI/AAMI VP20-1994, Section 6 (Requirements for <u>In Vivo</u> Preclinical and Clinical Evaluation); when the risk cannot be assessed solely through <u>in vitro</u> testing.</p>
	<p align="center">Labeling - Instructions for Use</p> <p>Provide labeling in accordance with ANSI/AAMI VP20-1994, Section 4.6 (General Information and Instructions for Use), Section 4.1 (Configuration and Size Designation), Section 4.2 (Intended Clinical Use Designation), and information, as appropriate, in accordance with Section 4.8 (Marking).</p>
	<p>Recommend product-specific techniques for implanting the vascular graft, (e.g., tunneling with consideration for external support, where appropriate, and methods to avoid kinking, where appropriate); and revising the vascular graft, if appropriate; and should indicate that care should be taken when cannulating the graft for dialysis access (e.g., avoidance of external support during cannulation, proper rotation of cannulation sites, post cannulation care such as proper compression to achieve hemostasis, etc).</p>
	<p>Provide appropriate instructions for graft handling and sizing (with consideration for external support, if appropriate, and potential arterial steal syndrome, if appropriate).</p>
	<p>State that the health care provider is responsible for instructing the patient as to proper postoperative care.</p>
	<p>Include a summary of the clinical studies, if clinical studies were submitted in the 510(k).</p>